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(54) **REMOTE RESERVOIR RESISTIVITY MAPPING**

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(58) **Field of Search** 324/354, 357, 324/359, 332, 334, 336, 337, 344; 702/5, 6, 7, 11

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(57) **ABSTRACT**

A method for surface estimation of reservoir properties, wherein location of and average earth resistivities above, below, and horizontally adjacent to the subsurface geologic formation are first determined using geological and geophysical data in the vicinity of the subsurface geologic formation. Then dimensions and probing frequency for an electromagnetic source are determined to substantially maximize transmitted vertical and horizontal electric currents at the subsurface geologic formation, using the location and the average earth resistivities. Next, the electromagnetic source is activated at or near surface, approximately centered above the subsurface geologic formation and a plurality of components of electromagnetic response is measured with a receiver array. Geometrical and electrical parameter constraints are determined, using the geological and geophysical data. Finally, the electromagnetic response is processed using the geometrical and electrical parameter constraints to produce inverted vertical and horizontal resistivity depth images. Optionally, the inverted resistivity depth images may be combined with the geological and geophysical data to estimate the reservoir fluid and shaliness properties.

33 Claims, 9 Drawing Sheets-